The Perverse Effects of Social Transparency on Online Advice Taking

Duyen T. Nguyen, Laura A. Dabbish, Sara Kiesler
Human-Computer Interaction Institute
School of Computer Science
Carnegie Mellon University, Pittsburgh, PA, 15213

ABSTRACT
Increasingly, the advice people receive on the Internet is socially transparent in the sense that it displays contextual information about the advice-givers or their actions. We hypothesize that activity transparency—seeing an advice giver's process while creating his or her recommendations—will increase advice taking. We report three experiments testing the effect of activity transparency on taking mediocre advice. We found that the presence of a web history increased the likelihood of following a financial advisor's advice and reduced participant earnings (Exp. 1), especially when the web history implied greater task focus (Exp. 2, 3). CSCW research usually emphasizes how to increase information sharing; this work suggests when shared information may be inappropriate. We suggest ways to counter activity transparency's potential downsides.

Author Keywords
Social transparency; online advice; decision making; persuasion; credibility; information sharing

ACM Classification Keywords
H.5.3 Group and Organization Interfaces: Computer-supported cooperative work

General Terms
Experimentation, Human Factors

INTRODUCTION
Many people go online to get advice in domains ranging from medical care to financial decision-making [e.g., 23]. Frequently, this advice has unknown or unclear sources [27]. Increasingly, however, advice seekers see more information about potential sources of advice. This information might include ratings of advisors or their profiles, evidence of others' use of the advice, or even source code. We argue here that social transparency about the online activities of an advisor can lead to a sense of familiarity and trust in the advice. If the advice is wrong or misleading, this information will have the perverse effect of increasing the persuasive impact of the advice.

In this paper, we test how a form of social transparency called "activity transparency" [55] affects advice taking. Activity transparency means that advice seekers can see some or all of the advisor's online activity [55]. In three experiments, participants were shown mediocre advice before they made financial investment decisions. We varied whether the advisor's web history was visible (Exp 1), the work-related content of the web history (Exp 2), and the presence of non-work web history (Exp 3). We measured whether participants took the advice. This work contributes to the CSCW literature by extending our understanding of the impact of new forms of social transparency. We demonstrate how information about a source's actions can seem informative and cause people to adopt the source's mediocre advice.

BACKGROUND
Erickson & Kellogg [19] introduced the term *social translucence* to describe communication system designs that provide mediated visibility of other participants. Stuart et al. [55] extended the notion of social translucence to include visibility of actions on information artifacts. Examples of this *activity transparency* are found in systems such as the open-source repository of GitHub that displays the number of changes to a shared document, or commits to a software project [37], Wikipedia, which displays the editors' discussion about an article's content [33], and websites that display the date and time of the latest updates to a webpage.

Activity transparency can improve the perceived quality of information when it showcases the source's expertise in a subject matter [33], or it can make information seem less reliable, for example when it suggests flaws and conflicts in the information creation process [60]. For example, Towne et al. [41] found that Wikipedia editing information reduced an article's credibility when it revealed conflict, lack of expertise, and inefficiencies among the editors. In this situation, activity transparency gave strong negative cues about the editing process.

Seeing a source's work activity also can affect perceptions of a source's credibility [27, 22, 21]. Wikipedia changes suggest contributors' expertise [33, 56, 62]. Users of GitHub intuit developers' level of expertise from relevant activity histories of other users [16]. Shoppers rate websites that display photographs of a company's past selling and buying activities as more credible than websites that do not display such photographs [47].

HYPOTHESES

Most previous studies of social translucence and transparency have focused on the transparency of a source's identity [31, 37, 59] or content [e.g., 21, 22]. This prior work is consistent with theoretical research in social psychology on how people use social cues to verify the utility and quality of information [28, 29]. Petty & Cacioppo's Elaboration Likelihood Model [43] suggests that when people lack the ability or expertise to evaluate the quality of information directly, they rely on irrelevant social cues to accept or reject the information.

Extending this prior work to activity transparency, we suggest that incidental information displayed online about the activities of an information source will increase the influence of the source's information. Consistent with this idea, Cramer et al. [14] found that those using an online art recommender tended to follow system recommendations more if they were given information on why the recommender system picked certain works of art to recommend (i.e., the algorithm the system used for making recommendations). We extend this work to show that activity transparency can increase advice taking even when the advice is of poor quality.

We hypothesized:

H1: Activity transparency will increase the influence of mediocre advice.

Prior work also suggests that activity transparency may increase advice taking through its effect on perceived credibility [e.g., 27]. Source credibility has long been known to increase trust [8] and advice taking [11, 58].

H2: Activity transparency will increase the advisor's credibility.

H3: Perceived advisor credibility will increase the influence of mediocre advice.

To test these hypotheses, we conducted three online experiments. In these experiments, participants completed a financial investment task. They received advice from an unfamiliar advisor, either with or without activity transparency--a snapshot of the advisor's web history. We measured whether participants adopted the advice, how they performed on the financial task, and how credible they rated their advisors and the advice they gave.

GENERAL METHOD FOR ALL EXPERIMENTS

The participants were asked to select a hedge fund to invest from a list of funds. The best performance was a choice that took potential profit, risk, and fees into account to obtain the highest net value of the investment.

Task

Participants completed a financial investment decision task adapted from Godek and Murray [24]. Participants chose one fund from a list of hedge funds that promised the largest return. They were given data on each fund about its risk (on a scale from 1 to 10), potential return (1 to 10), flat fee (a percentage, such as 2%), and performance fee (ranging from 20% to 25%) (see Table 1).

Fund	Risk	Return	Flat fee	Performance fee
Mainoways	4	4	2%	22%
Carisies	5	6	2%	22%

Table 1. Two sample funds & the attributes to evaluate them

We chose this financial investment task for several reasons. First, financial investment is a common task among adults, but it is new to virtually all of our participants, and thus is interesting to them. Second, it is easy enough that they could learn (with a practice phase) which objective investment was a good choice, but also hard enough that an advice will be seen as useful. As it is hard for participants to evaluate the correctness of the advice, this task is not demonstrable, and thus it reduces bias towards either accepting or rejecting the advice [10]. Fourth, the task has a measureable outcome, based on the quality of the hedge fund people chose.

Procedure

Experiments 1, 2 and 3 all involved the same procedure as shown in Figure 1. Participants read a page of information about investing in hedge funds, completed a comprehension check, and practiced evaluating 10 hedge funds. They were asked to rate them on a scale of 1 (Bad) to 3 (Good). They then viewed the funds' historical performance in the market so they could compare their ratings with the 'correct' historical ratings. To reinforce learning, we asked participants to report their own number of correct ratings (based on the historical standard) and their opinions of the practice.

After their practice, participants completed an investment decision task three times (center box of figure 1). The first time they completed the task, they viewed a list of funds, rated the funds and selected an investment (steps A and C

Figure 1. Experimental procedure.

only in Figure 1). This selection served as our baseline condition to assess performance without any advice. The participants then completed the investment task two more times and were shown professional advice (step B in Figure 1). As we are interested in adoption of poor quality advice, the advisor always gave mediocre advice—a fund with a historical rating lower than 3—but not so poor that the advice would be unbelievable.

All participants earned at least $5. We also gave them a bonus of up to $5, based on their performance in the investment tasks. Participants earned a higher bonus if they chose to invest in funds with a historical rating of 3 (Good).
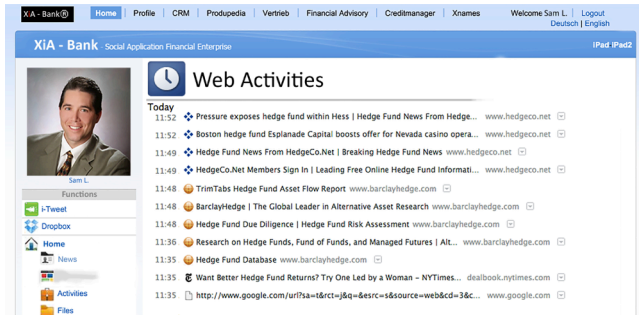

Figure 2. Profile page of the advisor in the activity transparency condition.
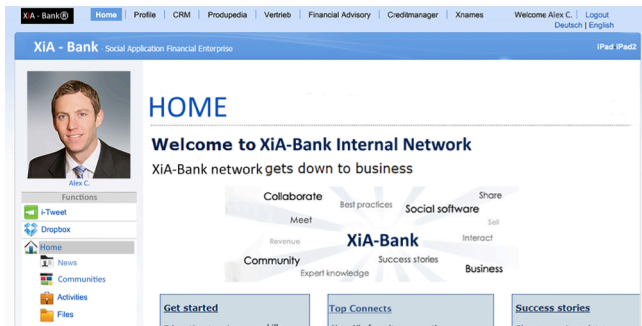

Figure 3. Profile page of the advisor in the no transparency condition.

Activity Transparency Manipulation
Each participant chose three investments. To "help" with two of the choices, the participant got advice from two different advisors. The advisor in the activity transparency condition had a profile page with a snap shot of his web activity on the right (Figure 2). The one in the no transparency condition had a profile page without the web history log (Figure 3). The activity transparency manipulation is thus within-subject.

The advisors shown came from XiA bank, had profile pages of the same design with blue and gray theme and with the photos shown in Figure 2 and 3. Advisor photos were professional images of a white male, aged 25 to 30. The names of the advisors were Alex C. and Sam L. Their names and photos were countered-balanced so that each

person appeared equally often across the transparency and no transparency conditions.

We told participants the web history snapshot was taken while the advisor was constructing the advice. The web history reflected the advisor's activities leading to his advice, such as the websites he consulted or information he searched. Browsing histories are common online activity traces that can be found, and are currently used by third parties to improve online services [39, 41].

Dependent Measures
We collected 3 dependent measures: 1) behavioral measurements of advice taking, 2) credibility ratings of the advisor and the advice, and 3) performance measurements of participants' three chosen funds.

Advice taking. For the second and third investment tasks, participants received recommendations from the advisors about which fund to choose and then made their decisions. We recorded the fund that participants picked, and created a binary dependent variable of whether participants chose the same (mediocre) fund recommended by the advisor. We were interested in how transparency would affect adoption of bad advice. Therefore, higher adoption score is equivalent to investing in a poorer hedge fund.

Credibility of advisor. After the 3 investment tasks, participants completed a questionnaire to measure their evaluation of the advisor and advice and to assess their demographic characteristics. To measure the advisor's credibility, we adapted eight Likert items (1 – strongly disagree to 7 – strongly agree; Table 2), from Meyers [40] and Fogg and Tseng [22]. We created a credibility scale by averaging the items (Cronbach's α = .95) (Table 2).

Survey Items
This analyst was competent.
This analyst was experienced with hedge fund investment.
This analyst was an expert about hedge fund investment.
This analyst was trustworthy.
This analyst was reliable.
This analyst was honest.
This analyst was helpful to me during this task.
This analyst was unbiased.

**Table 2. Advisor credibility scale.**

Earnings. We calculated the amount of money participants earned as a bonus based on their performance in the three investment tasks. Specifically, they earned $1.50 per task if they chose a fund with good historical value, $0.5 if they chose funds with moderate historical value, and $0.10 if they chose funds with a bad historical value. They earned $5 if all three funds they chose had good historical value, and $0 if all three funds had bad historical value.
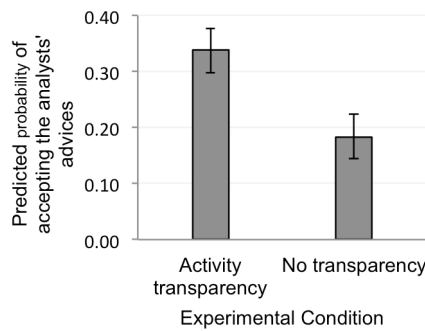
Figure 4a. Predicted probability of accepting mediocre advice, controlling for order of condition.
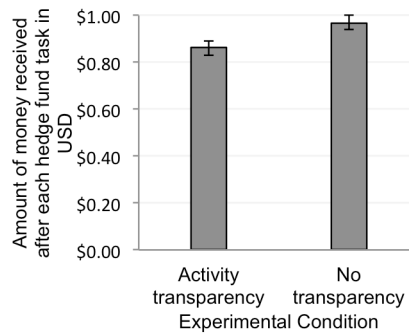
Figure 4b. Participants' earnings in USD after each hedge fund task.
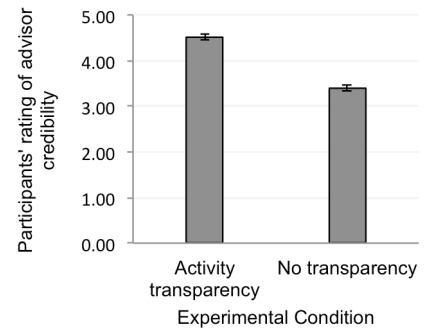
Figure 4c. Participants' rating of advisor credibility.

Figure 4. Experiment 1: Advice taking, earnings, and advisor credibility as a consequence of activity transparency

EXPERIMENT 1: EFFECT OF SHOWING AN ADVISOR'S WEB HISTORY ON TAKING HIS MEDIOCRE ADVICE

The purpose of this experiment was to test the hypothesis that a web history (activity transparency) would increase the influence of an advisor giving mediocre advice. The method of this experiment followed the general method described above.

Participants

We recruited 266 participants aged 18 to 65 (151 undergraduates, 9 graduate students, 75 employees, 9 retirees, 25 unemployed; 59% female) from an online participant pool. Participants were given $5 to $10 Amazon or Starbucks e-gift cards, depending on their investment performance. Only three participants held jobs in finance; none had experience with hedge fund investments. On a scale of 1 (no knowledge at all) to 7 (extremely knowledgeable), their average level of financial investment knowledge prior to the experiment was 2.5 ($SD = 1.54$).

Method

The method followed the general method describe above. In the activity transparency condition, the profile of the advisor contained a web browsing history showing only professional financial investment sites such as bloomberg.com. In the no activity transparency condition, the profile did not show any web history or any other activity information.

Results

Of 266 participants, 229 (86%) reported the analyst in the activity transparency condition did more research than the analyst in the no transparency condition, a probability of 0.86, SD = 95% CI [0.82, 0.90], significantly larger than 0.50 in a two-tailed Chi-square test ($\chi^2 [1] = 154.19, p < .001$).

Advice taking

We predicted that participants would be more likely to follow the mediocre advice from an advisor in the activity transparency condition (H1). To test this hypothesis, we conducted a mixed effects logistic regression on whether participants accepted the advice in the two tasks on which they received advice. Mixed effects logistic regression is used to analyze repeated binary response variables [30]. We included as fixed factors the experimental condition (activity transparency or no transparency), the order of the tasks in these conditions (activity transparency first or second), the interaction between experimental conditions and order of the tasks, and performance in the baseline condition with no advice. Because the design was within-subjects, participants were a random effect. We used the glmer function of the lme4 package in R [3].

Only the transparency experimental condition (activity transparency vs. no transparency) had a significant effect on the likelihood of accepting the mediocre advice ($\beta = .95$, SE = .31, 95% CI [.34, 1.55], $z = 3.089, p < .01$). The odds of participants accepting the advice in the activity transparency condition was 2.59 times as high as the odds in the no transparency condition, with 95% CI [1.42, 4.76] (fig. 4a).

Did participants recognize the advice they had received was poor quality? After the task was over, we asked participants to rate, from 1 (strongly disagree) to 7 (strongly agree), if the advice given by the advisors was good. The mean response was 3.40, SD = 1.55, 95% CI [3.28, 3.54], significantly smaller than 4 (neutral) in a two-tailed t-test ($t [525] = -8.62, p < .001$). We also asked participants to rate all the funds in the list on a scale of 1 (Bad) to 3 (Good) in terms of their value for investment before they saw the advisor's recommendation (see fig. 1). The mean of this value rating for the hedge fund that the advisor recommended was 1.80, SD = .69, 95% CI [1.74, 1.86], significantly lower than 2 (average) in a two-tailed t-test ($t [530] = -6.45, p < .001$). These data show that, before seeing the advice, participants did not think the funds recommended by the advisors were of high quality. Yet, in the transparency condition, they were likely to follow this advice.

Earnings

We conducted a mixed-effect ANOVA on the payment received for each task, with advice taking and performance in the baseline condition task (no advice) as fixed factors. We found a significant negative effect of advice taking on earnings ($\beta = -0.34$, SE = 0.02, 95% CI [-0.37, -0.30], F [1, 518.3] = -16.59, $p < .001$). Thus, following mediocre advice was not simply an intellectual exercise; it reduced

participants' monetary pay for the experiment. On each of the two hedge fund tasks where participants received advice, those who accepted the mediocre advice received on average \$.40 (SE = .03). Those who didn't follow the advice received on average \$1.09 (SE = .02), about 69 cents more than those who did (Cohen's D = -1.19) (fig. 4b).

Advisor credibility

H2 and H3 predict that activity transparency increases advice taking through its influence on perceived advisor credibility. Based on Preacher and Hayes [46], to test this mediation effect of advisor credibility, we first tested the effect of activity transparency on advisor credibility using a mixed-effect ANOVA with advisor credibility as the dependent variable, experimental conditions, order of the tasks, and their interaction as fixed effect, and participants as a random effect (R^2 = 0.42). We found that activity transparency had a significantly positive effect on advisor credibility (β = 0.55, SE = 0.04, 95% CI [0.47, 0.63], F [1, 264] = 166.51, $p < .001$), and no other variable was significant. Participants rated the advisor in the activity transparency condition (M = 4.53, SE = 0.07) more credible (Cohen's D = 1.04) than the advisor in the no transparency condition (M = 3.41, SE = 0.07) (fig. 4c). H2 was supported.
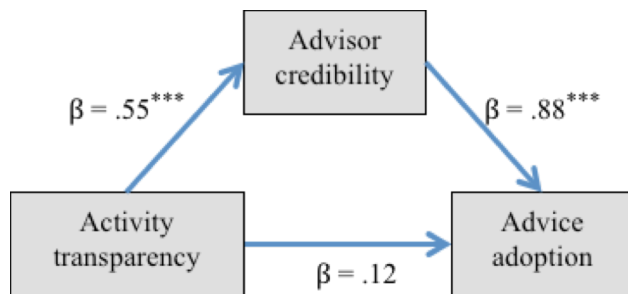
Figure 5. Experiment 1: Mediation effect of advisor credibility. 2-tailed *p* values: * *p* <= .05, ** *p* < .01, * *p* < .001.**

We then retested the effect of activity transparency on advice adoption using a mixed-effect logistic regression similar to the model we used to test H1, but with the addition of advisor credibility as a fixed factor. We found that the effect of activity transparency on advice adoption became insignificant (z = 0.36, p = 0.71), and the effect of advisor credibility on advice adoption was significant (β = .88, SE = .12, 95% CI [.65, 1.12], z = 7.03, $p < .001$). H3 was supported. A Sobel test [1, 51] showed the mediated effect of activity transparency on advice adoption was significant (t = 5.25, SE = .17, $p < .001$). These results show that seeing an advisor's web history affects advice adoption indirectly through its effect on advisor credibility. Figure 5 shows the mediation effect.

Discussion of Experiment 1

The findings of Experiment 1 were that a snapshot of an advisor's web searches increased the likelihood of people following his mediocre advice. Statistically, the effect

occurred because the web history information made the advisors look more credible than when there was no web history shown. The positive effect of activity transparency on advice adoption in Experiment 1, however, may be due to the fact that the web history consisted of only URLs related to financial research. What if the web history also includes searches for off-task or non-work information? Some literature suggests that this might not hurt; it could increase perceptions of the advisor as a normal person like us [9, 35, 42]. We therefore decided to test the effect of showing non-work and work-related web history on an advisor's persuasiveness.

EXPERIMENT 2: EFFECT OF SHOWING SOME NON-WORK WEB HISTORY ON TAKING AN ADVISOR'S MEDIOCRE ADVICE

In Experiment 1, because we did not vary what was shown in the advisor's web history, it is unclear whether the effect of that history was due to the presence of any history or the particular content of that history. Many studies [63, 4, 5, 49] show that any information about a person can increase positive responses to that person.

Independent Variable

To explore these explanations, in Experiment 2 we used the same general method but varied the content of the web history shown to participants. Each participant was randomly assigned to one of two types of web history for the advisor with a web history shown: a web history with only work-related URLS (about financial sites), or a web history with both work-related and non-work URLs (e.g., Youtube.com for online videos, Yelp.com for online shopping and service recommendations). We hypothesized that visibility of some non-work URLs in the advisor's history might create an impression of a distracted advisor and thus negatively affect his credibility.
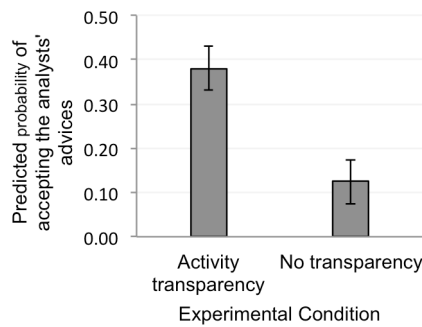
Participants

One hundred and eight participants saw the web history with only work-related URLs (work-related only condition), and 110 participants saw the history with both work-related, and non-work URLs (mixed work and non-work condition). They were 61% female, and aged 18 to 65, with education ranging from high school diplomas to graduate degrees and little financial knowledge. They completed an online survey with the same tasks, procedures, measures, and payment scheme as those used in Experiment 1. No participant had experience with hedge fund investments before the experiment.

Results

Figure 6 shows the effect of activity transparency on the three dependent variables: advice taking, participants' earnings after each hedge fund task, and participants' rating of advisor credibility.
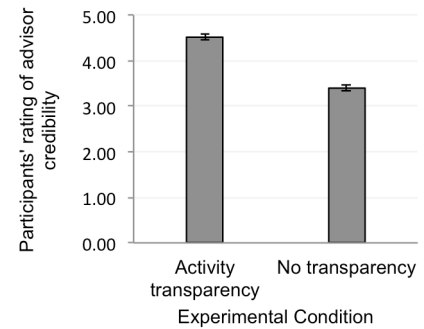
Advice taking

We conducted a mixed-effect logistic regression on advice adoption, with fixed effects of activity transparency vs. no transparency and work-related history vs. half non-work related history nested within these conditions. (The effect of

Figure 6a. Predicted probability of accepting mediocre advice from an advisor.
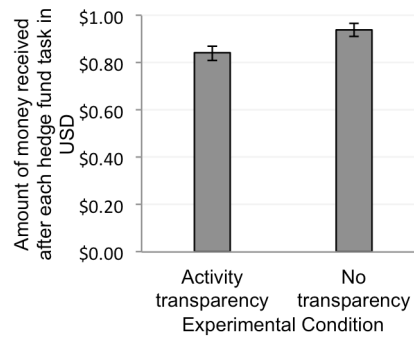
Figure 6b. Participants' earnings in USD after each hedge fund task.

Figure 6c. Participants' rating of advisor credibility.

Figure 6. Experiment 2: Advice taking, earnings, and advisor credibility as a consequence of activity transparency.

web history content is nested within experimental conditions because such effect is not meaningful in the no transparency condition.)
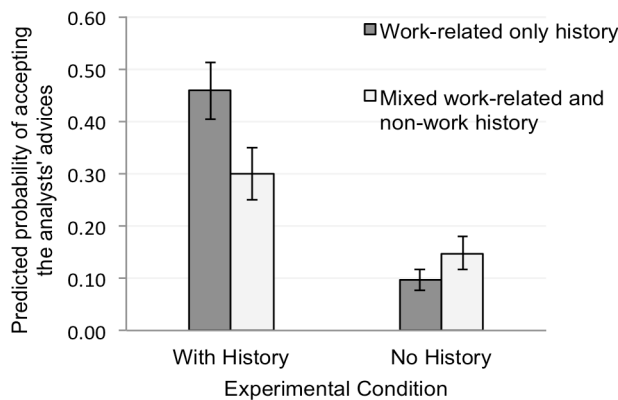
Figure 7. Probability of accepting mediocre advice from an advisor as a consequence of activity transparency (seeing the advisor's web history vs. not seeing) and the content of that activity.

We found a significant effect of experimental condition (β = .91, SE = .33, z = 2.71, p < .01), and a significant effect of the work-related websites when participants saw the web history (β = .68, SE = .29, z = 2.36, p = .01). These effects show that advice adoption was influenced both by seeing the web history and by its content as work-related. The odds that participants would accept mediocre advice after seeing an advisor's web history was 2.48 times higher (95% CI [1.30, 4.74]) than after seeing no history (fig. 6a). The odds that the participant who saw only work-related websites (about hedge fund research) would adopt the advice was 1.97 times higher (95% CI [1.11, 3.48]) than one who saw the mixed work and non-work history.

Figure 7 shows the likelihood of advice adoption when participants saw only work-related websites in the web history and when they saw a mixture of work and non-work websites. The results show that the nature of the web history matters; however, either kind of web history had a stronger impact than no history at all.

Earnings

We found a significant negative effect of activity transparency on earnings (β = -.05, SE = 0.02, 95% CI [-.08, -.01], F [1, 225] = 4.26, p = .04). Participants in the activity transparency condition earned on average $.84 (SE = .04). Those in the no transparency condition earned on average $.94 (SE = .04), 10 cents more than those in the activity transparency condition (Cohen's D = -.16) (fig. 6b).

Advisor credibility

A mixed effects ANOVA on advisor credibility with experimental condition as the fixed factor showed that activity transparency also had a significant effect on advisor credibility (β = .35, SE = .04, 95% CI [.27, .42], F[1, 224] = 55.42, p < .001), controlling for the work-related content of the web history. Participants rated the advisor's credibility higher after seeing either web history (M = 4.35, SE = .07) than seeing no history (M = 3.65, SE = .07) (Cohen's D = .68) (fig. 6c).

We analyzed the effect of activity transparency further by dividing the participants into two groups: participants who saw the work-related only history versus those who saw the mixed work and non-work history. We conducted a mixed-effect ANOVA on the advisor's credibility, with experimental condition as the fixed effect. Participants who saw only work-related activities rated the advisor significantly higher in credibility after seeing the history (M = 4.65, SE = .09) than if they did not see it (M = 3.41, SE = .09) (β = .62, SE = .06, 95% CI [.50, .73], F[1, 112] = 100.36, p < .001). Those who saw the mixed work and non-work history did not increase their credibility ratings as compared to seeing no history at all (β = .07, SE = .07, F[1, 112] = 1.17, p = .28).

A mixed-effect logistic regression on advice adoption with advisor's credibility as the fixed effect showed that, as in Experiment 1, credibility had a significant positive effect (β = .93, SE = .12, z = 7.43, p < .001) on advice adoption.

To evaluate mediation effects, we conducted a mixed-effect linear regression on the analyst credibility with experimental condition, and web history content nested in experimental

condition as the fixed effects, and participants as the random effect (R^2 = .31). We found that when participants saw a web history, the content of that web history significantly influenced the participants' ratings of the analyst's credibility (β = .30, SE = .07, 95% CI [.16, .43], F[1, 298] = 16.82, $p <$ .001). Participants who saw the web history with only work-related URLs rated the advisor higher in credibility (M = 4.65, SE = .09) than those who saw the history with mixed work and non-work URLs (M = 4.04, SE = .09) (Cohen's D = .40).

After participants saw all advisors, and finished all investment tasks, we asked them what they noticed about the activities of the two analysts displayed on their profile page. Participant comments provide a window into their thought processes when they saw financial web activity:

"Thoroughly researched list and lots of effort." P25

"It showed a lot of hedge fund websites and general information you would expect an analyst to look up for you when trying to make good choices about what to invest in." P100

On the other hand, participants who saw a web history with mixed work and non-work URLs from the advisor perceived the advisor to be distracted or unfocused.

"(He was) procrastinating." P56

"He wasn't doing his job. he was on sites like amazon, and was listening to music on spotify. also, he had lots of general google searches... not the sort of thing you want from an analyst." P78

Discussion of Experiment 2
Our results show that the likelihood of accepting an advisor's mediocre advice is enhanced significantly by work-related activities that raise the advisor's credibility. However, even when the advisor was shown as searching both non-work and work-related sites, participants were still more likely to adopt his mediocre advice than when there was no web history in his profile at all. In Experiment 3, we examined whether an advisor with only a non-work web history would still have an influence on advice taking.

EXPERIMENT 3: EFFECT OF SHOWING ONLY HIS NON-WORK WEB HISTORY ON TAKING AN ADVISOR'S MEDIOCRE ADVICE
In Experiment 3, the web history of the advisor in the activity transparency condition showed only non-work URLs. We used the same tasks, procedures, dependent measures, and payment scheme as those used in experiments 1 and 2 (fig. 1). The only difference from the first two experiments was the independent variable.

Independent Variable
In Experiment 3 we manipulated the presence of a non-work activity history within subjects. Participants saw one advisor with a profile with a non-work web history consisting of six

URLs from Amazon.com, Yelp.com, and Youtube.com. The other advisor had a profile without any web history.

Participants
Sixty one participants (67% female), aged 18 to 65 with highest education ranging from high school diplomas to graduate degrees and little financial knowledge, completed the study with the same tasks, procedures, measures, and payment scheme as those used in Experiment 1.

Results
Figure 8 shows the effect of activity transparency on three dependent variables: advice taking, participants' earnings after each hedge fund task, and participants' rating of advisor credibility.

Advice taking
To test the net effect of activity transparency and content of the history on advice taking, we first conducted a mixed-effect logistic regression on advice taking, with experimental condition as the fixed effect. We found no significant effect of experimental condition on advice taking (β = .62, SE = .45, z = 1.37, p = .17) (fig. 8a). This result suggests that the negative implications of the non-work activity history cancelled any positive effect of mere transparency. We next included the advisor's credibility in the mixed model regression. (The Pearson's correlation between credibility and experimental condition is r = -.46.)

We found that when controlling for the advisor's perceived credibility, the non-work web history increased advice taking significantly compared to the no transparency condition (β = 1.33, SE = .53, 95% CI [.29, 2.36], z = 2.50, p = .01). Given two advisors rated equally in credibility, the odds that participants would adopt the mediocre advice from the advisor with a non-work activity history was 3.78 times higher (95% CI [1.33, 10.60]) than the odds of accepting the advice from the advisor without any web history. As in our first two experiments, we also found that credibility had a significant positive effect on advice adoption (β = .83, SE = .27, 95% CI [.30, 1.35], z = 3.07, p < .01).
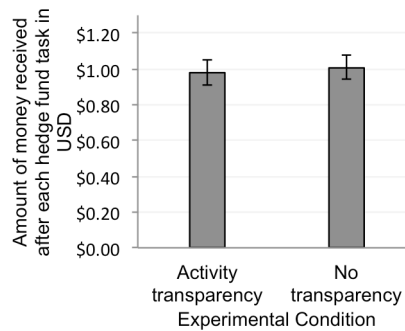
Earnings
We conducted a mixed-effect ANOVA on the payment participants received after each hedge fund task that they were given an advice, with experimental condition as the fixed factor. We did not find any effect of activity transparency on payment (F [1, 60] = 2.7, p = .10) (fig. 8b). On each hedge fund task, participants in the activity transparency condition made on average $.98 (SE = .07). Those in the no transparency condition made on average $1.01 (SE = .07).
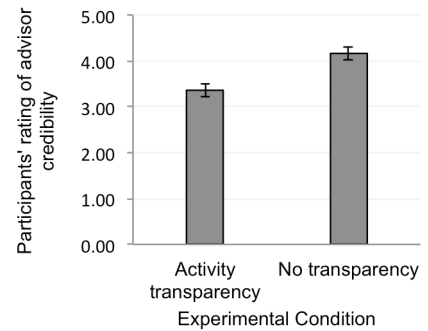
Advisor credibility
We tested whether transparency of non-work activities lowered the advisor's credibility compared to not seeing any history. We conducted a mixed model ANOVA on the ratings of the advisor's credibility with experimental condition (activity transparency vs. no transparency) as the fixed effect, and participants as the random effect.
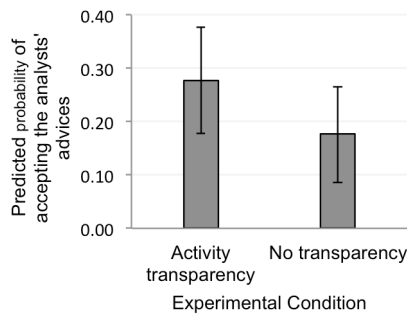
Figure 8a. Predicted probability of accepting mediocre advice from an advisor.

Figure 8b. Participants' earnings in USD after each hedge fund task.

Figure 8c. Participants' rating of advisor credibility.

Figure 8. Experiment 3: Advice taking, earnings, and advisor credibility as a consequence of activity transparency.

As expected, we found a significant negative effect of seeing the non-work web history (β = -.39, SE = .09, 95% CI [.21, .56], F[1, 60] = 19.34, p < .001). Participants rated the advisor with activity transparency (of non-work URLs) lower in credibility (M = 3.36, SE = .14) than the advisor with no activity transparency (M = 4.16, SE = .14) (Cohen's D = .74) (fig. 8c).

Discussion of Experiment 3
In experiment 3 the advisor's credibility was damaged by the non-work web history and participants were no longer inclined to take his advice over the advisor without a web history. However, it should be noted that the non-work web history did not reduce advice taking below that of the advisor without a web history. Moreover, controlling statistically for the effect of credibility, the non-work web history actually increased advice taking. These statistical analyses imply that just showing a web history could cancel the impact of poor credibility. We discuss some of the potential mechanisms below.

GENERAL DISCUSSION
Our results extend the literature about social transparency by explaining how it influences advice taking. Although previous studies [e.g. 16, 47, 8] show the effect of social transparency and information source credibility on trust and other social perceptions, none have investigated how transparency can cause people to adopt poor quality advice. Our study shows that activity transparency increased the persuasive impact of poor quality advice except when the web history showed the advisor to be working completely off task (e.g., on Amazon searches). Our study and the earlier Towne et al.'s study on Wikipedia change histories [60] are not entirely comparable because of the difference in people's tasks and the dependent measures, but both studies suggest activity transparency can reduce people's ability to objectively evaluate an information source.

Why transparency works
Participant comments and the credibility ratings from our experiments suggested that participants used the advisor's web history to evaluate the amount of effort and concentration the advisor gave to the advising task. Non-work searches in the web history suggested a lack of effort or distraction. However, the statistical analyses suggested that the impact of web history might have gone beyond its impact on advisor credibility.

One possibility is that the extra data about the advisor's activity increased people's sense of familiarity with the advisor, and indirectly increased comfort with the advisor's advice. However, the proposition that transparency increases people's sense of familiarity with advice needs to be tested in the future.

Activity transparency also might influence advice taking by increasing the memorability of an advisor. In our experiments, showing the advisors' web activities could have provided additional anchor points for participants' representation of them in memory, increasing their social impact [52, 53, 57]. Studies also suggest that people have a more positive attitude towards a person or organization if they see information that makes that person seem more realistic and lively [1, 36,]. New research could help us understand the effect of activity transparency by varying the vividness of the activity information in an advisor's profile (e.g., still photos of the advisor at work versus a video of the advisor at work).

Finally, activity transparency might influence advice taking by reducing psychological distance from an advisor. Things far removed from our direct experience, such as far-away places and events in the future) can feel psychologically distant [61]. Being able to see an advisor's activity may have given participants the impression that the advisor was real or close by, reducing their psychological distance from him. We could examine whether the effects of transparency on psychological distance vary as the physical or temporal distance of advisor activity changes.

Activity transparency second-order consequences
Participants in our study were more susceptible to bad advice and performed more poorly when they were exposed to a web history log of the advisor. Prior work shows the collaborative benefits of more awareness of another's activities for supporting opportunistic connections among

people or avoiding coordination conflicts (e.g., [55, 48]). By contrast, our work suggests that more awareness may have deleterious effects on people's ability to objectively evaluate information from another person. The second-order consequence might be to damage collaborations by injecting bad information into group decisions.

In remote teams, where participants are not well-acquainted and span disciplines, not all team members have the knowledge to assess information in an unfamiliar field of expertise. People may less objectively evaluate information and advice from collaborators in the remote work setting when these collaborators have heightened activity transparency. There might be a difficult tradeoff between enhanced connectivity and coordination among members of a remote team with activity transparency, versus indiscriminate information use and poor decision-making quality. Researchers will need to examine how activity transparency influences information use in a team, and how collaborative technology can counteract the potential negative performance impact of increased transparency while supporting coordination and awareness among members.

Limitations & future directions
We used experiments so that we could control important variables: the advisor's characteristics and expertise, the nature of the advice, and the measures of advice taking. The repeated measures, counterbalanced design allowed us to make comparisons for each person, controlling the impact of the participant's own expertise and motivation. We therefore can draw valid implications of the impact of activity transparency on advice taking in this online setting, but we cannot generalize to everyday advice taking without further research.

Web history reflecting the information gathering process in the making of an advice, while common and easy to access [39], may not be a realistic representation of the types of activity traces that web users normally see online. Future studies can employ a more realistic type of activity transparency such as the changes to a document, or the date and time of the last edits to a document.

Hedge fund investment choices are only one kind of online decision-making on which people want expert advice. To generalize beyond this task would require research using other types of online tasks and other advisors, and varying the expertise of the recipients of the advice.

We also did not vary the quality of the advice; in each case, the advisor gave mediocre advice, not the worst investment but not the best either. Varying the quality of the advice could help us understand if people will accept really bad advice with high activity transparency. The earning scheme that forms our performance measure was designed to reflect the real-life consequences of trusting mediocre advice to a certain extent, but it cannot be generalized beyond the experimental settings. Future work should consider more realistic performance measures.

CONCLUSION
In three experiments, we found that activity transparency increased adoption of a financial advisor's mediocre advice and reduced earnings in an investment task, and that the effect of transparency was greater the more it revealed work-related activity of the advisor. Our study calls attention to the potential negative social effects of activity transparency and contributes to the literature on the direct and second order effects of social transparency. When designing for online platforms for Q&A, recommendations, or advising, in order not to help bad advisors, and to counter inappropriate persuasion [44], we should implement features such as rating systems for advice that would encourage people to use discretion.

REFERENCES
1. Allen, D. G., Van Scotter, J. R., & Otondo, R. F. (2004). Recruitment communication media: impact on pre-hire outcomes. *Personnel Psychology, 57*, 143–171.

2. Baron, R. M., & Kenny, D. A. (1986). The moderator mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173-1182.

3. Bates, D., Maechler, M., Bolker, B., Walker, S. (2014). *Linear mixed-effects models using Eigen and S4*, version 1.0-6[computer software]. Available from: http://cran.r-project.org/web/packages/lme4/index.html.

4. Bornstein, R. F. (1989). Exposure and Affect: Overview and Meta-Analysis of Research, 1986–1987. *Psychological Bulletin, 106,* 265–289.

5. Bornstein, R. F., & D'Agostino, P. R. (1992) Stimulus Recognition and the Mere Exposure Effect. *Journal of Personality and Social Psychology, 63,* 545–552.

6. Bonhard, P., Harries, C., McCarthy, J., & Sasse, M. A. (2006). Accounting for taste: using profile similarity to improve recommender systems. *In Proceedings of CHI '06*, 1057-1066. New York: ACM.

7. Brenoff, A. (2013). What bad advice did this heart attack survivor get? *Huffington Post.* Retrieve from: http://www.huffingtonpost.com/2013/09/24/online-myths_n_3954799.html

8. Briggs, P., Burford, B., De Angeli, A., & Lynch, P. (2002). Trust in online advice. *Social Science & Computing Review 20, 3*, 321-332.

9. Cain, D. M., Loewenstein, G., & Moore, D. A. (2005). The Dirt on Coming Clean: Perverse Effects of Disclosing Conflicts of Interest. *Journal of Legal Studies, 34, 1,* 1–25.

10. Campbell, J. & Stasser, G. (2006). The Influence of Time and Task Demonstrability on Decision-Making in Computer-Mediated and Face-to-Face Groups. *Small Group Research, 37*, 217-294.

11. Casaló, L. V., Flavián, C., & Guinalíu, M. (2011). Understanding the intention to follow the advice obtained in an online travel community. *Computers in Human Behaviors, 27, 2*, 622-633.

12. Chung, M., Oden, R. P., Joyner, B. L., Sims, A., & Moon, R. Y. (2012). Safe Infant Sleep Recommendations on the Internet: Let's Google It. *Journal of Pediatrics, 161(6)*, 1080-1084.

13. Coker, B. (2011). Freedom to surf: the positive effects of workplace Internet leisure browsing. *New Technology, Work and Employment, 26*, 238–247.

14. Cramer, H., Evers, V., Ramlal, S., van Someren, H., Rutledge, L., Stash, N., Aroyo, L., & Wielinga, B. (2008). The effects of transparency on trust in and acceptance of a content-based art recommender. *User Model User-Adap Inter, 18*, 455–496.

15. Crocco A. G., Villasis-Keever M., & Jadad A. R. (2002). Analysis of cases of harm associated with use of health information on the Internet. *Journal of American Medical Association, 287(21)*, 2869–2871.

16. Dabbish, L., Stuart, C., Tsay, J., & Herbsleb, J. (2012). Social coding in GitHub: transparency and collaboration in an open software repository. *Proc. CSCW '12,* 1277-1286.

17. De Alfaro, L., Kulshreshtha, A., Pye, I., & Adler. B. T. (2011). Reputation systems for open collaboration. *Commun. ACM 54, 8*, 81-87.

18. Dembroski, T. M., Lasater, T. M. & Ramirez, A. (1978). Communicator Similarity, Fear Arousing Communications, and Compliance with Health Care Recommendations. *Journal of Applied Social Psychology, 8*, 254–269.

19. Erickson, T. & Kellogg, W.A (2000). Social translucence: An approach to designing systems that support social processes. *Proc. CHI'00*, 59-83.

20. Erickson, T., Smith, D. N., Kellogg, W. A., Laff, M., Richards, J. T., & Bradner, E. (1999). Socially translucent systems: social proxies, persistent conversation, and the design of "babble". Proc. CHI '99, 72-79.

21. Fogg, B. J., Marshall, J., Laraki, O., Osipovich, A., Varma, C., Fang, N., Paul, J., Rangnekar, A., Shon, J., Swani, P., & Treinen, M. (2001). What makes Web sites credible?: a report on a large quantitative study. *Proc. CHI '01*, 61-68.

22. Fogg, B. J., Tseng, H. (1999). The elements of computer credibility. *Proc. CHI'99,* 80-87.

23. Fox, S., & Duggan, M. (2013). One in three American adults have gone online to figure out a medical condition. *Pew Internet & American Life Project.* Retrieve from: http://pewinternet.org/Reports/2013/Health-online/Summary-of-Findings.aspx.

24. Gilbert, E. (2012). Designing social translucence over social networks. Proc. CHI '12, 2731-2740.

25. Gino, F. (2008). Do we listen to advice just because we paid for it? The impact of advice cost on its use. *Organizational Behavior and Human Decision Processes, 107,* 234-245.

26. Godek, B., & Murray, K. B. (2008). Willingness to pay for advice: The role of rational and experiential processing. *Organizational Behavior and Human Decision Processes, 106, 1*, 77–87.

27. Golbeck, J. & Fleischmann, K. R. (2010). Trust in social Q&A: the impact of text and photo cues of expertise. In *Proc. ASIS&T '10, 47*, Article 77, 10 pages.

28. Griffin, D., Gonzalez, R., Varey, C. (2001). The heuristics and biases approach to judgment under uncertainty. In *Blackwell Handbook of Social Psychology: Intraindividual Procresses (A. Tesser & N. Schwarz Eds.)*, 207-235.

29. Hancock, J. & Dunham, P (2001). Impression formation in computer-mediated communication revisited: An analysis of the breath and intensity of impressions. *Communication Research, 28*, 3, 325-347.

30. Hu, F. B., Goldberg, J., Hedeker, D., Flay, B. F., & Pentz, M. A. (1998). Comparison of Population-Averaged and Subject-Specific Approaches for Analyzing Repeated Binary Outcomes. *American Journal of Epidemiology, 147, 7*, 694-704.

31. Janiszewski, C., & Meyvis, T. (2001). Effect of brand logo complexity, repetition, and spacing on processing fluency and judgement. *Journal of Consumer Research, 28,* 1, 18-32.

32. Kinnaird, P., Dabbish, L., & Kiesler, S. (2012). Workflow transparency in a microtask marketplace. *Proc. GROUP '12*, 281-284.

33. Kittur, A., Suh, B., & Chi, E. H. (2008). "Can You Ever Trust a Wiki?". *Proc. CSCW'08, 477.*

34. Lee, U., Kang, H., Yi, E., Yi, M., & Kantola, J. (2012). Understanding mobile Q&A usage: an exploratory study. *Proc CHI '12,* 3215-3224.

35. Loewenstein, G., Cain, D. M., Sah, S. (2011). The Limits of Transparency: Pitfalls and Potential of Disclosing Conflicts of Interest. *American Economic Review, 101, 3*, 423-428.

36. Nisbett, R. & Lee, R. (1980). *Human Inference: Strategies and Shortcomings of Social Judgment.* Englewood Cliffs, NJ: Prentice-Hall.

37. Marlow, J., Dabbish, L. & Herbsleb, J. (2013). Impression formation in online peer production: activity traces and personal profiles in github. *Proc. CSCW '13,* 117-128.

38. Mas, A. and Moretti, E. (2009). Peers at work. *American Economic Review, 99, 1*, 112-145.

39. Meyer, J. R. & Mitchell, J. C. (2012). Third-party web tracking: policy and technology. *Proc. SP 2012*, 413-427.

40. Meyer, P. (1988). Defining and measuring credibility of news- papers: Developing an index. *Journalism Quarterly, 65,* 567– 574.

41. O'Reilly, D. (2011, Nov 1st). How to know who is tracking your web activities. *CNET Tech Culture*. Retrieved from: http://www.cnet.com/how-to/how-to-know-who-is-tracking-your-web-activities/

42. Pearson, S. D., Kleinman, K., & Rusinak. D. (2006). A Trial of Disclosing Physicians' Financial Incentives to Patients. *Archives of Internal Medicine, 166,* 623–628.

43. Petty, R. E., & Cacioppo, J. T. (1986). The Elaboration Likelihood Model of Persuasion. In *Communication and Persuasion – Springer Series in Social Psychology*, pp. 1-24. New York, NY: Springer.

44. Petty, R. E., & Cacioppo, J. T. (1977). Forewarning, cognitive responding, and resistance to persuasion. *Journal of Personality and Social Psychology, 35,* 9, 645-655.

45. Pirolli, P., Wollny, E., & Suh. B. (2009). "So You Know You're Getting the Best Possible Information: A Tool that Increases Wikipedia Credibility." *Proc. CHI'09,* 1505.

46. Preacher, K. J., & Hayes, A. F. (2007). Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research, 42, 1*, 185-227.

47. Riegelsberger, J., & Sasse, M. A. (2001). Trustbuilders and trustbusters: The role of trust cues in interfaces to e-commerce applications [WWW page]. *Paper presented at the 1st IFIP Conference on E-commerce, E-business, E-government.* Available: http://www.cs.ucl.ac.uk/staff/J.Riegelsberger/trustbuilders_and_trustbusters.htm

48. Scupelli, P., Kiesler, S., & Fussell, S.R. (2005). Project view IM: A tool for juggling multiple projects and teams. *Proc. CHI'05,* 1773.

49. Shapiro, S. (1999). When an Ad's Influence Is beyond Our Conscious Control: Perceptual and Conceptual Fluency Effects Caused by Incidental Ad Exposure. *Journal of Consumer Research, 26,* 16–36.

50. Sillence, E., Briggs, P., Harris, P., & Fishwick. L. (2006). A framework for understanding trust factors in web-based health advice. *International Journal of Human-Computer Studies 64, 8*, 697-713.

51. Sobel, M. E. (1982). Asymptotic intervals for indirect effects in structural equations models. In S. Leinhart (Ed.), *Sociological methodology* (pp.290-312). San Francisco: Jossey-Bass.

52. Slusher, M. P., & Anderson, C. A. (1996). Using causal persuasive arguments to change beliefs and teach new information: The mediating role of explanation availability and evaluation bias in the acceptance of knowledge. *Journal of Educational Psychology, 88,* 110-122.

53. Srull, T. K., Lichtenstein, M., & Rothbart, M. (1985). Associative storage and retrieval processes in person memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 11,* 2, 316-345.

54. Steel, E. and Fowler, G. Facebook in privacy breach. *Wall Street Journal*, 2010.

55. Stuart, H. C., Dabbish, L., Kiesler, S., Kinnaird, P., & Kang, R. (2012). Social transparency in networked information exchange: a theoretical framework. *Proc. of CSCW '12*, 451-460.

56. Suh, B., Chi, E.H., Kittur, A., and Pendleton, B.A. Lifting the veil: Improving accountability and social transparency in Wikipedia with wikidashboard. *Proc. CHI '08,* 1037-1040.

57. Tversky, A. & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive psychology, 5*, 2, 207-232.

58. Tausczik, Y. R., & Pennebaker, J. W. (2011). Predicting the perceived quality of online mathematics contributions from users' reputations. *Proc. CHI '11,* 1885-1888.

59. Toma, C. L. (2010). Perceptions of trustworthiness online: the role of visual and textual information. In *Proc. CSCW '10,* 13-22. New York, NY: ACM.

60. Towne, B. W., Kittur, A., Kinnaird, P., & Herbsleb, J. (2013). Your process is showing: controversy management and perceived quality in Wikipedia. *Proc. of CSCW '13*, 1059-1068.

61. Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological review, 117,* 2, 440-463.

62. Viégas, F.B., Wattenberg, M., and Dave, K. Studying cooperation and conflict between authors with history flow visualizations. *Proc. CHI '04,* 575-582.

63. Zajonc, R. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology, 9,* 2, 1-27.